



US008906803B2

(12) **United States Patent**
Okandan et al.

(10) **Patent No.:** **US 8,906,803 B2**
(45) **Date of Patent:** **Dec. 9, 2014**

(54) **METHOD OF FORMING THROUGH SUBSTRATE VIAS (TSVS) AND SINGULATING AND RELEASING DIE HAVING THE TSVS FROM A MECHANICAL SUPPORT SUBSTRATE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/063,152**

(22) Filed: **Oct. 25, 2013**

(65) **Prior Publication Data**

US 2014/0264770 A1 Sep. 18, 2014

Related U.S. Application Data

(60) Provisional application No. 61/788,937, filed on Mar. 15, 2013.

(51) **Int. Cl.**

H01L 21/44 (2006.01)

H01L 21/768 (2006.01)

H01L 21/78 (2006.01)

H01L 23/48 (2006.01)

(52) **U.S. Cl.**

CPC **H01L 21/76877** (2013.01); **H01L 21/78** (2013.01); **H01L 23/481** (2013.01); **H01L 2924/0002** (2013.01)

USPC **438/667**; 438/113; 257/E21.585

(58) **Field of Classification Search**

CPC H01L 21/76877; H01L 21/7806;
H01L 21/7813; H01L 23/481; H01L 23/49827

USPC 257/E23.011, E23.067, E23.174,
257/E21.585, E21.586; 438/113, 667

See application file for complete search history.

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(57)

ABSTRACT

Accessing a workpiece object in semiconductor processing is disclosed. The workpiece object includes a mechanical support substrate, a release layer over the mechanical support substrate, and an integrated circuit substrate coupled over the release layer. The integrated circuit substrate includes a device layer having semiconductor devices. The method also includes etching through-substrate via (TSV) openings through the integrated circuit substrate that have buried ends at or within the release layer including using the release layer as an etch stop. TSVs are formed by introducing one or more conductive materials into the TSV openings. A die singulation trench is etched at least substantially through the integrated circuit substrate around a perimeter of an integrated circuit die. The integrated circuit die is at least substantially released from the mechanical support substrate.

14 Claims, 8 Drawing Sheets

